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100.

The electrode assembly of claim 46, wherein:

the first layer of separator material forming a pocket around the anode is formed by folding a separator material sheet over a top edge of the anode, conforming the separator material sheet to the anode, and joining the separator material sheet to itself with a seal at a bottom edge of the anode; and

the second layer of separator material forming a pocket around the cathode is formed by folding a separator material sheet over a top edge of the cathode, conforming the separator material sheet to the cathode, and joining the separator material sheet to itself with a seal at a bottom edge of the cathode.--

#### REMARKS

In the Office Action dated February 7, 2001, the pending claims addressed were identified as 1-8, 10-17, 28-35, 37-44, 46-53, and 55-72. These claims were rejected on various grounds. Claims 1-8, 28-35, 37-44, 46-53, and 55-72 were rejected due to language found to be indefinite relating to what constitutes the outermost "winding" or "layer" of the coiled electrode assembly and use of "one or more outer windings". The pending claims were variously rejected under Sections 102 and 103 based upon the Takeuchi et al. U.S. Pat. No. 5,549,717; Goebel et al. U.S. Pat. No. 4,565,752; and Kelm et al. U.S. Pat. No. 5,486,215. The claims are amended as set forth above; no new matter has been introduced in making these amendments.

The present invention comprises an electrode assembly for an electrochemical cell of the type comprising an elongated anode assembly and an elongated cathode assembly wound unidirectionally in side-by-side relation into a preferably flattened coil comprising a plurality of layers built up from an innermost layer through a plurality of inner layers to

an outermost layer such that the outermost layer of the coil comprises an end segment of preferably the anode assembly.

One aspect of the present invention that is not found in the prior art is the formation of the elongated anode and cathode assemblies comprising at least one or both of the anodes and cathodes fitting within pockets or pouches made of a separator material so that the anodes and/or cathode materials are encased. In this way, each adjacent layer of the coil is formed of anodes and cathodes that are separated by two layers of separator material when both the anode and cathode are enclosed within a separator layer pocket and wound into the coil or one separator layer if only one of the anode or cathode is enclosed within a separator layer pocket. Encasing the anode and/or cathode in this way tends to contain anode and/or cathode material distorted or fractured in the process of forming the coil layers built up from the innermost layer to the outermost layer. This is especially useful to contain cathode materials embedded around the cathode current collector that tend to fracture or crumble when bent into small radius turns, when forming and bending pressure is applied and when swelling in use.

The Examiner cites the Kelm '215 patent as teaching this feature. In this regard, it is pointed out to the Examiner that the present application is a continuation-in-part of enclosed Howard et al. U.S. Patent No. 6,051,038 which itself is a division of enclosed Howard et al. U.S. Patent No. 5,439,760 which was filed on November 19, 1993. The Kelm '215 patent is commonly assigned and was also filed on November 19, 1993. The Howard '760 patent and the Kelm '215 patent both disclose the same subject matter that the Examiner relies upon in citing the Kelm '215 patent, that is the envelopes of separator material that surround the anode and the cathode except for the outwardly extending tabs.

Compare FIG. 9 of the parent '760 patent to FIG. 5 of the Kelm '215 patent. Hence any reliance upon the Kelm '215 patent for teaching of commonly disclosed features of the claimed invention is erroneous. Thus, there is no teaching of this feature in a cited prior art reference.

A second feature of the present invention relates to the construction of the anode from at least one strip of alkali material and an anode current collector, wherein the anode current collector is shorter in length than the length of the strip. The inventors have discovered that problems can arise from bending an anode and cathode over a small radius inner turns to form the inner layers of the coil because the metallic current collectors can bulge out in the small radius turn and perforate the separator that is compressed in the small radius turn. Therefore in the present invention, this problem is minimized in that the anode current collector is disposed against or pressed into or encased within an end segment of the elongated strip as shown in FIGs. 1A and 1B and further described in reference to FIGs. 24-37. The end segment containing the current collector extends toward the other end segment devoid of the current collector and corresponds to an end segment of the anode assembly that when wound with the cathode assembly into the coil is disposed at least in the outermost layer. The end segment containing the anode current collector may extend into one or more inner layers from the outermost layer but does not extend into the innermost layer, and preferably into any inner layers that are built up from small diameter turns. The lengths of the anode current collector are expressed in percentages of the full length of the anode. As noted on pages 27-35, it is found that the shortening of the anode current collector does not reduce cell capacity and its disposition in this way reduces perforations and other damage assessed in

accelerated discharge experiments. This feature contributes benefits referred to in pages 5 and 6 of the application.

The Examiner cites the Goebel '752 patent as teaching an electrode assembly where the anode current collector 29 is shorter in length and width than the cathode current collector 28. However, this is true in the Goebel '726 patent, because the cathode current collector is wound up in two turns as the outermost layer of the assembly. The anode current collector extends through the innermost winding or layer. Thus, Goebel teaches just the opposite of this feature of the present invention.

A further feature of the present invention involves the way that the anode is built up from two strips of alkali material through the length of the anode except for the anode end segment that is bent and pressed to form the outermost layer. The anode current collector is disposed between the two strips of alkali material and extends over the anode end segment. This saves space and alkali material without negatively affecting performance.

The Examiner cites the Takeuchi '717 patent as teaching this feature. However, this feature is described in the parent '760 patent that predates the Takeuchi '717 patent. See col. 6, lines 56-65. Thus, the Takeuchi '717 patent is not applicable.

These features are claimed in various ways and combinations in the newly amended claims. The changes are shown in the attached marked up claims. The claim preambles now recite how the anode and cathode assemblies are wound from an innermost layer through inner layers to an outermost layer. The anode assembly comprises at least an anode strip and an anode current collector that in certain claims is encased in a pocket or pouch of an envelope or container formed of the separator

material. The cathode assembly is characterized in like manner. In certain claims, the anode current collector is characterized as being exposed in the outer layer. In other claims, the length of the anode current collector is emphasized.

The above features of the invention thus appear alone or in combination in the amended independent claims. Certain dependent claims are added to characterize some of the features more particularly. It is respectfully submitted that the amended claims are definite and allowable over the teachings of the cited references.

Based upon the amendments being made herein, Applicant submits that the claims now pending are in condition for allowance and requests that a notice of allowance be issued in due course. The Examiner is invited to contact the undersigned by telephone to discuss any issues that remain unresolved.

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Respectfully submitted,

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## MARKED UP CLAIMS

--1. (Four Times Amended) An electrode assembly for an electrochemical cell[,] of the type comprising an elongated anode assembly and an elongated cathode assembly wound unidirectionally in side-by-side relation into a coil comprising a plurality of alternating anode and cathode assembly layers built up from an innermost layer through inner layers to an outermost layer such that the outermost layer of the coil comprises an end segment of one of the anode assembly or the cathode assembly, wherein:

(a) [an] the anode assembly compris[ing]es:

(1) an anode comprising an elongated strip of alkali metal [forming an anode] and an anode current collector having at least a first connector tab disposed [on a first] to extend away from a side edge thereof, the [strip of] elongated strip of alkali metal having a first length [and a first height], the anode current collector having a second length [and a second height], the second length of the anode current collector being shorter than the first length of the elongated strip of alkali metal; and

(2) a first layer of separator material shaped to form a pocket around the anode to encase the anode therein and through which the first connector tab extends; and

(b) [a] the cathode assembly[,] compris[ing]es:

(1) a cathode comprising an elongated cathode current collector having a second connector tab disposed to extend away from [on] a [second] side edge thereof [at least a second connector tab], the

cathode current collector having a third length [and a third height;],  
and

[(2)] a cathode material bonded to the cathode current collector[,]; and

(2) a second layer of separator material shaped to form a pocket  
around the cathode to encase the cathode therein and through  
which the first connector tab extends,

[(c) a first separator layer interposed between the anode and cathode assemblies, the separator layer forming a pocket around the anode assembly with the connector tab being exposed through a slit in the pocket, the pocket being formed by folding the separator over a top edge of the anode assembly, conforming the separator layer to the anode assembly, and joining the separator layer to itself with a seal at a bottom edge of the anode assembly; and

(d) a second separator layer interposed between the anode and cathode assemblies, the second separator layer forming a pocket around the cathode assembly with the connector tab being exposed through a slit in the pocket, the pocket being formed by folding the separator over a top edge of the cathode assembly, conforming the separator layer to the cathode assembly, and joining the separator layer to itself with a seal at a bottom edge of the cathode assembly.

the anode and cathode assemblies forming a unidirectional electrode winding having two substantially straight sides and being wound so that the anode current collector is located on one or more outer layers of the unidirectional electrode

winding]

whereby two layers of separator material separate the anode and cathode when wound into the coil of the electrode assembly.

10. (Four Times Amended) An electrode assembly for an electrochemical cell[,] of the type comprising an elongated anode assembly and an elongated cathode assembly wound unidirectionally in side-by-side relation into a coil comprising a plurality of alternating anode and cathode assembly layers built up from an innermost layer through inner layers to an outermost layer such that the outermost layer of the coil comprises an end segment of the anode assembly, wherein:

(a) [an] the anode assembly compris[ing]es:

(1) an anode comprising an elongated strip of alkali metal [forming an anode] and an anode current collector having at least a first connector tab disposed [on a first] to extend away from a side edge thereof, the [strip of] elongated strip of alkali metal having a first length [and a first height], the anode current collector having a second length, [and a second height, the first height of the anode current collector being shorter than the second height of the elongated strip of alkali metal] the anode current collector being disposed against an end segment of the elongated strip of alkali metal corresponding to an end segment of the anode assembly that when wound into the coil disposes at least a portion of the anode current collector in the outermost layer of the coil; and



- (2) a first layer of separator material shaped to form a pocket around the anode to encase the anode therein and through which the first connector tab extends; and
- (b) [a] the cathode assembly[,] compris[ing]es:
  - (1) a cathode comprising an elongated cathode current collector having a second connector tab disposed to extend away from [on] a [second] side edge thereof [at least a second connector tab], the cathode current collector having a third length [and a third height], the third length shorter than the first length by an amount that enables the end segment of the anode assembly to be wound into the outermost layer of the coil[,] and
  - [(2)] a cathode material bonded to the cathode current collector[.]; and
  - (2) a second layer of separator material shaped to form a pocket around the cathode to encase the cathode therein and through which the first connector tab extends,
- [( c) a first separator layer interposed between the anode and cathode assemblies, the separator layer forming a pocket around the anode assembly with the connector tab being exposed through a slit in the pocket, the pocket being formed by folding the separator over a top edge of the anode assembly, conforming the separator layer to the anode assembly, and joining the separator layer to itself with a seal at a bottom edge of the anode assembly; and
- (d) a second separator layer interposed between the anode and cathode

assemblies, the second separator layer forming a pocket around the cathode assembly with the connector tab being exposed through a slit in the pocket, the pocket being formed by folding the separator over a top edge of the cathode assembly, conforming the separator layer to the cathode assembly, and joining the separator layer to itself with a seal at a bottom edge of the cathode assembly.

the anode and cathode assemblies forming a unidirectional electrode winding having two substantially straight sides, the unidirectional electrode winding having the anode current collector as the outer winding]

whereby two layers of separator material separate the anode and cathode when wound into the coil of the electrode assembly.

28. (Four Times Amended) An electrode assembly for an electrochemical cell[,] of the type comprising an elongated anode assembly and an elongated cathode assembly wound unidirectionally in side-by-side relation into a coil comprising a plurality of alternating anode and cathode assembly layers built up from an innermost layer through inner layers to an outermost layer such that the outermost layer of the coil comprises an end segment of the anode assembly, wherein:

- (a) [an] the anode assembly compris[ing]es an anode comprising an elongated strip of alkali metal [forming an anode] and an anode current collector having at least a first connector tab disposed [on a first] to extend away from a side edge thereof, the elongated strip of [elongated] alkali metal having a first length [and a first height], the anode current collector having

a second length [and a second height], the second length being shorter than the first length, the anode current collector being disposed against an end segment of the elongated strip of alkali metal corresponding to an end segment of the anode assembly that when wound into the coil disposes the anode current collector in the outermost layer of the coil;

(b) [a] the cathode assembly,] compris[ing:]es

[(1)] a cathode comprising an elongated cathode current collector having a second connector tab disposed to extend away from [on] a [second] side edge thereof [at least a second connector tab], the cathode current collector having a third length [and a third height], the third length shorter than the first length by an amount that enables the end segment of the anode assembly to be wound into the outermost layer of the coil,] and

[(2)] a cathode material bonded to the cathode current collector[,]; and

(c) a [first] separator layer interposed between the anode and cathode assemblies[; and

the anode and cathode assemblies forming a unidirectional electrode winding having two substantially straight sides, the second height of the anode current collector being shorter than the third height of the cathode current collector, and the anode current collector forming one or more outer layers of the unidirectional electrode winding].

37. (Four Times Amended) An electrode assembly for an electrochemical cell[,] of the type comprising an elongated anode assembly and an elongated cathode assembly wound unidirectionally in side-by-side relation into a coil comprising a plurality of alternating anode and cathode assembly layers built up from an innermost layer through inner layers to an outermost layer such that the outermost layer of the coil comprises an end segment of the anode assembly, wherein:

- (a) [an] the anode assembly compris[ing]es an anode comprising an elongated strip of alkali metal [forming an anode] and an anode current collector having at least a first connector tab disposed [on a first] to extend away from a side edge thereof, the elongated strip of [elongated] alkali metal having a first length [and a first height], the anode current collector having a second length [and a second height], the second length of the anode current collector being shorter than the first length of the elongated strip of alkali metal [the second height of the anode current collector being shorter than the first height of the elongated strip of alkali metal], the anode current collector being disposed within the elongated strip of alkali metal except in an end segment of the elongated strip of alkali metal corresponding to an end segment of the anode assembly that when wound into the coil disposes the anode current collector in the outermost layer of the coil and exposed alongside the elongated strip of alkali metal;
- (b) [a] the cathode assembly[,] compris[ing:]es
  - [(1)] a cathode comprising an elongated cathode current collector having a second connector tab disposed to extend away from [on] a

[second] side edge thereof [at least a second connector tab], the cathode current collector having a third length [and a third height;], the third length shorter than the first length by an amount that enables the end segment of the anode assembly to be wound into the outermost layer of the coil and

[(2)] a cathode material bonded to the cathode current collector[,]; and

- (c) at least one separator layer interposed between the anode and cathode assemblies[, the separator layer forming a pocket around the anode assembly with the connector tab being exposed through a slit in the pocket, the pocket being formed by folding the separator over a top edge of the anode assembly, conforming the separator layer to the anode assembly, and joining the separator layer to itself with a seal at a bottom edge of the anode assembly; and
- (d) a second separator layer interposed between the anode and cathode assemblies, the second separator layer forming a pocket around the cathode assembly with the connector tab being exposed through a slit in the pocket;

the anode and cathode assemblies forming a unidirectional electrode winding having two substantially straight sides and further having the anode current collector forming the one or more outer layers of the unidirectional electrode winding].

46. (Four Times Amended) An electrode assembly for an electrochemical cell[,] of the type comprising an elongated anode assembly and an elongated cathode assembly wound unidirectionally in side-by-side relation into a coil comprising a plurality of alternating anode and cathode assembly layers built up from an innermost layer through inner layers to an outermost layer such that the outermost layer of the coil comprises an end segment of the anode assembly, wherein:

(a) [an] the anode assembly [comprising] comprises:

- (1) an anode comprising an elongated strip of alkali metal [forming an anode] and an anode current collector having at least a first connector tab disposed [on a first] to extend away from a side edge thereof, the [strip of] elongated strip of alkali metal having a first length [and a first height], the anode current collector having a second length [and a second height], the second length of the anode current collector being shorter than the first length of the elongated strip of alkali metal, the anode current collector being disposed within the elongated strip of alkali metal except in an end segment of the elongated strip of alkali metal corresponding to an end segment of the anode assembly that when wound into the coil disposes the anode current collector in the outermost layer of the coil and exposed alongside the elongated strip of alkali metal; and
- (2) a first layer of separator material shaped to form a pocket around the anode to encase the anode therein and through which the first connector tab extends; and

- (b) [a] the cathode assembly[,] compris[ing:]es:
- (1) a cathode comprising an elongated cathode current collector having a second connector tab disposed to extend away from [on] a [second] side edge thereof [at least a second connector tab], the cathode current collector having a third length [and a third height;], the third length shorter than the first length by an amount that enables the end segment of the anode assembly to be wound into the outermost layer of the coil and
- [(2)] a cathode material bonded to the cathode current collector[,]; and
- (2) a second layer of separator material shaped to form a pocket around the cathode to encase the cathode therein and through which the second connector tab extends;
- [(c) at least one separator layer interposed between the anode and cathode assemblies[, the separator layer forming a pocket around the anode assembly with the connector tab being exposed through a slit in the pocket, the pocket being formed by folding the separator over a top edge of the anode assembly, conforming the separator layer to the anode assembly, and joining the separator layer to itself with a seal at a bottom edge of the anode assembly; and
- (d) a second separator layer interposed between the anode and cathode assemblies, the second separator layer forming a pocket around the cathode assembly with the connector tab being exposed through a slit in the pocket;

the anode and cathode assemblies forming a unidirectional electrode winding having two substantially straight sides and further having the anode current collector forming the one or more outer layers of the unidirectional electrode winding].

whereby two layers of separator material separate the anode and cathode when wound into the coil of the electrode assembly.

55. (Four Times Amended) An electrode assembly for an electrochemical cell[,] of the type comprising an elongated anode assembly and an elongated cathode assembly wound unidirectionally in side-by-side relation into a coil comprising a plurality of alternating anode and cathode assembly layers built up from an innermost layer through inner layers to an outermost layer such that the outermost layer of the coil comprises an end segment of the anode assembly, wherein:

- (a) [an] the anode assembly compris[ing]es an anode comprising an elongated strip of alkali metal [forming an anode] and an anode current collector having at least a first connector tab disposed [on a first] to extend away from a side edge thereof, the elongated strip of [elongated] alkali metal having a first length, the anode current collector having a second length the second length of the anode current collector being shorter than the first length of the elongated strip of alkali metal, the anode current collector being disposed against an end segment of the elongated strip of alkali metal corresponding to an end segment of the anode assembly that when wound into the coil disposes the anode current collector in the outermost layer of the coil and into or through at least one inner anode assembly



layer of the coil not constituting the innermost layer;

(b) [a] the cathode assembly[,] compris[ing:]es

[(1)] a cathode comprising an elongated cathode current collector having a second connector tab disposed to extend away from [on] a [second] side edge thereof [at least a second connector tab], the cathode current collector having a third length [and a third height], the third length shorter than the first length by an amount that enables the end segment of the anode assembly to be wound into the outermost layer of the coil,[,] and

[(2)] a cathode material bonded to the cathode current collector[,]; and

(c) [at least a first] a separator layer interposed between the anode and cathode assemblies[; and

the anode and cathode assemblies forming a unidirectional electrode winding having the anode current collector located only in one or more outer layers of the electrode winding].